The Impact of Long-Term Dance Training on Cognition and Self-Reported Anxiety in Female Adolescents

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Introduction: Adolescence is a critical period for cognitive and emotional growth. In the U.S., an estimated 38% of high school students report serious cognitive difficulties, and about 20% of adolescents have a diagnosed mental or behavioral health condition such as anxiety, both associated with poorer academic performance and psychosocial functioning. Because both problems are common and affect how students do in school, it is worth finding accessible activities that might help with each. This study examined whether sustained participation in structured dance is associated with better cognitive functioning and reduced generalized anxiety among female high school students.
Methods: Forty-seven female adolescents aged 14–17 were recruited into two groups: dancers with $\geq$5 years of structured training (n = 22) and peers with no formal dance experience (control; n = 25). Cognitive functioning was assessed using standardized PsyToolkit tasks: Corsi Block Tapping Task (working memory), Mental Rotation Task (visuospatial reasoning), and Deary–Liewald Simple Reaction Time Task (processing speed). Anxiety was assessed with the Generalized Anxiety Disorder-7 (GAD-7). Groups were compared using independent-samples t-tests (Welch-corrected where variances were unequal), with Benjamini–Hochberg correction for multiple comparisons.
Results: Compared to controls, dancers demonstrated significantly faster reaction times (337.56 vs. 440.57 ms; p = .024, d = 0.90), higher visuospatial working memory span (Corsi span 5.56 vs. 4.14; p = .037, d = 0.82), and greater mental rotation accuracy (86.11% vs. 75.71%; p = .013, d = 0.95). Dancers also reported significantly lower generalized anxiety (GAD-7 4.36 vs. 7.86; p = .016, d = 0.98).
Conclusion: Long-term structured dance participation was associated with better cognitive performance, particularly in visuospatial working memory and spatial reasoning. Dancers also reported significantly lower anxiety, with a mean score in the minimal range compared with the mild range for non-dancers. The design is cross-sectional, so these results cannot show that dance causes the differences. They do suggest that dance is worth studying further as a possible support for cognitive development in adolescence, not only as an elective physical activity.

Keywords: Dance, Cognition, Anxiety, Female, Adolescents

Introduction

In the United States, cognitive difficulties among high school students represent a major public health concern. On the 2019 Youth Risk Behavior Survey, 38% of U.S. high school students (ages 14–18) reported serious difficulty concentrating, remembering, or making decisions because of a physical, mental, or emotional problem, including 45% of girls, and these difficulties were closely associated with emotional distress[1,2]. At the same time, roughly 20% of adolescents, about 5.3 million nationwide, have a diagnosed mental or behavioral health condition such as anxiety or depression[3], and nearly one in three U.S. adolescents meets criteria for an anxiety disorder at some point by late adolescence[4]. While cognitive and emotional difficulties are often studied separately, the two frequently overlap: adolescents with cognitive difficulties are also more likely to experience mental health challenges such as depression[1]. It makes sense, then, to look for interventions that could help with both. Adolescents with co-occurring cognitive and emotional difficulties often face substantial deficits in working memory, attention, and executive functioning, which can undermine academic performance, self-esteem, and social interactions[5,6]. Because thinking skills and emotional regulation are both still maturing in adolescence, this overlap is especially important during these years. Schools reach nearly all adolescents, and programs that target cognitive skills and mental health together could help students both academically and emotionally[7].

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Long-term dance participation has been linked to both cognitive and emotional benefits, and one likely reason is that dance draws on several neural systems at the same time, including sensory–motor integration, working memory, spatial navigation, rhythm processing, and social–emotional regulation[8–10]. Systematic reviews and randomized controlled trials in older adults indicate that dance interventions can improve global cognition[10] and white-matter integrity[11], although comparisons with other forms of exercise have been mixed; for example, one randomized trial found no advantage of social dancing over walking for executive function, but did find a benefit for spatial memory[12]. Cross-sectional studies also show structural and functional brain differences in expert dancers[13]. Dance has also been associated with fewer symptoms of depression and anxiety, possibly because it combines exercise, music, social contact, and emotional expression in a single activity[14,15]. One proposed explanation is that learning and performing choreography, which requires balance, timing, and moving in sync with others, may promote neuroplasticity. Exercise in general also raises levels of brain-derived neurotrophic factor (BDNF), a protein involved in learning and mood regulation[9,16].

Structured dance interventions have been shown to improve functional mobility and physical endurance[17,18], and neuroimaging studies suggest that the effects reach the brain as well. PET and MRI research has shown that dance activates the motor cortex, somatosensory cortex, basal ganglia, and cerebellum[19]. These regions are responsible for planning, sequencing, and coordinating voluntary movement, along with integrating sensory feedback. Longer-term dance training has also been associated with larger hippocampal volume and stronger white-matter pathways, both of which are tied to memory[9,11]. Neuropsychological (NPSY) tests of attention, working memory, learning, and perceptual-motor skills offer a way to measure these changes in behavior. Most of this evidence comes from older adults. Whether the same changes happen in adolescents is less clear, but the question is worth asking, since the adolescent brain is still changing quickly[7].

Alongside cognitive benefits, structured dance participation has been shown to support emotional and psychological well-being. Involvement in a variety of dance styles has been associated with reduced depressive symptoms and increased perceived competence[20], which may reflect gains in self-esteem and emotional regulation. Dance interventions have also been associated with improvements in quality of life and psychological well-being[15,17]. Possible reasons include the chance to express emotion through movement, the experience of moving in time with music and with other dancers, and the sense of identity that can come from performing. These experiences may matter most to teenagers, who are still working out their social roles and sense of self. Researchers typically measure these effects with standardized instruments such as the State–Trait Anxiety Inventory[21] and the Symptom Checklist-90[22], which measure anxiety and broader psychological symptoms. The present study used the briefer Generalized Anxiety Disorder 7-item scale (GAD-7), which has been validated in adolescent samples[23,24].

Most research on the cognitive and emotional benefits of dance, however, focuses on older adults. Far fewer studies have looked at adolescents, even though the brain is especially adaptable during these years. High school students also deal with academic pressure and constant comparison with peers, which can strain attention, mood, and self-esteem. Because dance combines movement, memorization, emotional expression, and working with others, it uses many of the same skills that are still developing at this age. If dance benefits cognition and mood in adults, it is reasonable to ask whether the same is true for teenagers, and there is little direct evidence either way. The present study addresses that question: do adolescents with long-term dance training perform better on standardized cognitive tasks and report less anxiety than adolescents with no formal dance experience?

Aim. This study examined whether long-term structured dance training ($\geq$ 5 years) is associated with differences in cognitive performance (visuospatial working memory, visuospatial reasoning, and processing speed) and self-reported anxiety in adolescent females, compared with non-dancers.

H1 (Working memory). Adolescents with $\geq$ 5 years of structured dance training will show higher visuospatial working memory, measured by the Corsi Block Tapping Task, than non-dancers, as choreography requires continuous spatial updating, sequencing, and motor planning[25].

H2 (Visuospatial reasoning). Dancers will show higher mental rotation accuracy, measured by the Mental Rotation Task, than non-dancers, consistent with the repeated spatial-transformation and embodied-cognition demands of dance[15,26].

H3 (Processing speed). Dancers will show faster processing speed and reaction time, measured by the Deary–Liewald Simple Reaction Time Task, than non-dancers, consistent with evidence that physical training and effort influence reaction time in physically active young adults[27].

H4 (Anxiety). Dancers will report lower generalized anxiety, measured by the GAD-7, than non-dancers, consistent with evidence that dance is associated with reduced anxiety and improved emotional regulation[14,15].

Theoretical framework

This study is grounded in embodied cognition, a framework proposing that repeated sensorimotor experience shapes related cognitive skills[26,28]. Applied to dance, this suggests that years of training could be linked to the specific skills measured

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here. Choreography requires dancers to keep track of their position and orientation in space, which connects to visuospatial reasoning (Mental Rotation Task) and working memory (Corsi Block Tapping Task). Reacting quickly to music and cues connects to processing speed (Simple Reaction Time Task). The routine, emotional outlet, and social support of regular dance classes connect to anxiety (GAD-7). These links come from earlier research and are offered only as possible explanations. This study did not include any neuroimaging, biochemical, or physiological measures, so it cannot test the mechanisms behind them.

Methods

The study recruited 54 female high school students (ages 14–17) into two pre-defined groups based on dance experience: a dance-trained group with $\geq$5 years of formal dance training and a non-dancer group with no prior formal dance experience. Participants were recruited through convenience sampling: an open invitation, along with consent and assent forms, was distributed to high schools in the surrounding area, and eligible students voluntarily enrolled by returning completed forms. Sample size was determined by the number of eligible students who enrolled during the recruitment period. With 22 dancers and 25 non-dancers, the study had 80% power (two-tailed $\alpha = .05$) to detect only large effects (Cohen's $d \approx 0.84$); power to detect a medium effect ($d = 0.5$) was approximately 39%. Inclusion criteria included regular school attendance, access to a computer that meets the study's technical requirements, and willingness to participate. Participants were excluded if they had a neurological or psychiatric disorder, were currently taking medication that affects cognition or mood, had significant uncorrected visual or motor impairments, or had a recent injury. Parental consent and student assent were collected digitally prior to participation.

Participants were included in the dancer group if they had at least 5 years of formal dance training and reported currently practicing at least one hour per week. Participants reported involvement in a range of dance styles, most commonly ballet, hip hop, contemporary, and folk. Several participants also reported "other" styles or mixed training backgrounds, so the groups training backgrounds were varied.

All assessments were administered online through PsyToolkit, a secure online experiment platform[29,30], and were completed at school or at home. To standardize testing conditions, students were required to use a laptop or desktop computer with a physical keyboard and a mouse or trackpad; smartphones, tablets, and touchscreen-only devices were not permitted, since they can introduce input variability and timing inaccuracies. Participants were also asked to complete the assessment battery in a quiet, well-lit room free of distractions, avoid caffeine or stimulants for at least 2 hours beforehand, and get a normal night's sleep before testing. The entire battery was completed in a single session. All responses were de-identified, and the data have been securely stored.

Outcome measures were selected to assess multiple cognitive domains and anxiety severity, using standardized tasks and questionnaires well established in the literature. All measures were implemented through PsyToolkit[31] (Figure 1).

Cognitive outcomes included the Deary–Liewald Simple Reaction Time task, a computerized measure of processing speed implemented as described in the PsyToolkit experiment library[32]. Visuospatial working memory span and sequencing ability were assessed using the Corsi Block Tapping Task, following the standard format and normative procedures described by Kessels et al., who validated it as a visuospatial memory assessment[33]. Visuospatial reasoning was measured with a computerized mental rotation task implemented in PsyToolkit, in which participants viewed a reference shape and identified which of two rotated shapes was identical to it (Figure 1C). The task is a two-dimensional adaptation of the mental rotation paradigm used in the classic three-dimensional Mental Rotation Test developed by Vandenberg and Kuse[34].

Each cognitive task was scored according to its standard conventions: mean reaction time (ms) for the simple reaction time task, maximum span length for the Corsi task, and percentage of correct responses for the mental rotation task.

Psychological outcomes were assessed using the Generalized Anxiety Disorder 7-item scale (GAD-7), a brief self-report questionnaire that screens for and assesses the severity of generalized anxiety. The GAD-7 has seven items scored 0–3 (total range 0–21), with established cutoffs for minimal, mild, moderate, and severe anxiety, and it is widely validated in both clinical and research settings. Respondents rate how often they have been bothered by each symptom over the preceding two weeks on a four-point scale (0 = not at all, 1 = several days, 2 = more than half the days, 3 = nearly every day). Its reliability and construct validity have also been established specifically in adolescent samples[23,24].

Potential limitations include variability in internet connectivity and differences in computer hardware; however, these issues were minimized by requiring standardized equipment (a laptop or desktop with a keyboard and mouse or trackpad) and by providing clear environmental and behavioral guidelines to minimize external influences on performance. Socioeconomic status was not formally measured using a standardized scale and was therefore not included in the analysis; future studies should incorporate such a measure to examine its potential influence on cognitive and emotional outcomes. As participation was voluntary, the sample was self-selected rather than random, which may limit the extent to which the findings generalize. Both groups were recruited through the same open invitation, applying similar selection pressures across groups, but self-selection bias cannot be fully ruled out.

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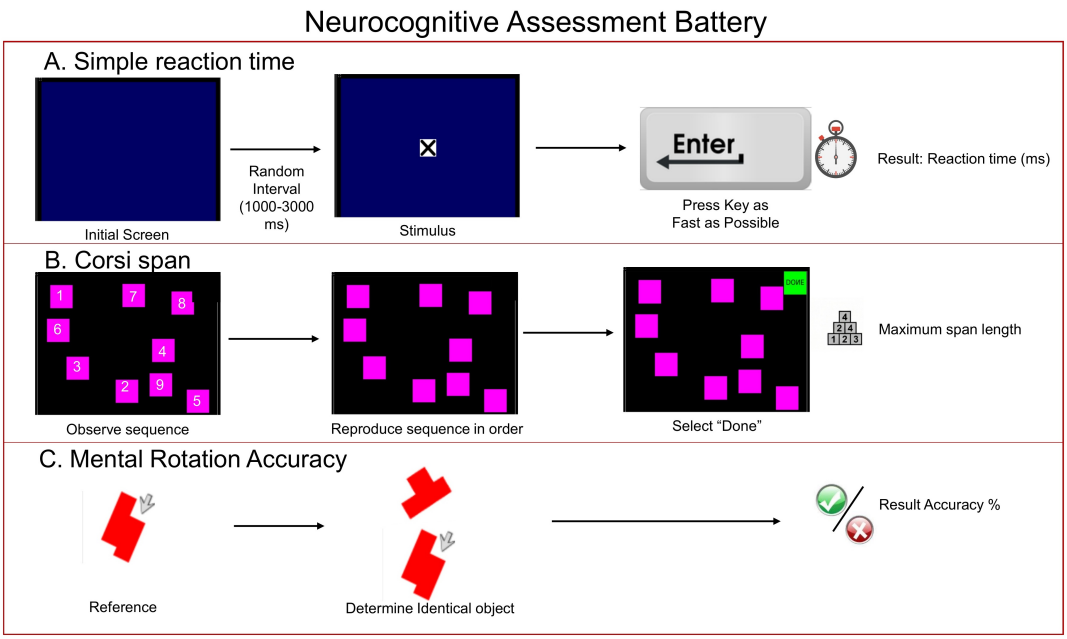

Figure. 1 Schematic of the neurocognitive assessment battery implemented via PsyToolkit. (A) Simple Reaction Time measuring stimulus-response processing speed; (B) Corsi Span task illustrating the observation and reproduction phases for visuospatial working memory; (C) Mental Rotation task depicting the comparison of a reference shape with rotated shapes for visuospatial reasoning accuracy.

Statistical Analysis

Independent-samples t-tests were used to compare age and grade level between groups, and Fisher's exact test was used to compare handedness. Group differences on each outcome were tested with independent-samples t-tests. Prior to analysis, the data were screened for outliers, and normality was assessed with Shapiro–Wilk tests; most variables were approximately normally distributed ($p > .05$). Levene's test for equality of variances was conducted for each comparison, and where the assumption of homogeneity of variance was violated, Welch's t-test was reported instead. Effect sizes were calculated using Cohen's d, with 0.2, 0.5, and 0.8 representing small, medium, and large effects, respectively. The three cognitive measures (visuospatial working memory, visuospatial reasoning, and processing speed) were treated as primary outcomes and self-reported anxiety (GAD-7) as a secondary outcome. The study was exploratory and not pre-registered. To limit false positives from multiple comparisons, p-values were adjusted across the four outcome comparisons using the Benjamini–Hochberg false discovery rate procedure.

Ethical Considerations

This study received Full Committee Review approval from the [blinded for review] Institutional Review Board (IRB) prior to participant recruitment and data collection, in accordance with Society for Science/ISEF rules for research involving human participants (ISEF Human Participants Form 4). The reviewing committee included three independent members unaffiliated with the research team: a school psychologist, a science educator, and a school administrator. The protocol was classified as greater than minimal risk. A formal risk assessment was completed, and parental permission and minor assent (collected digitally, as described above) were obtained for all participants. This IRB does not assign protocol numbers for student research; signed documentation is available on request.

Cognitive assessment and GAD-7 data were collected through PsyToolkit in de-identified form, with no key linking responses to participant identities. Data were stored within the password-protected PsyToolkit account and on a password-protected, school-managed computer. Identifiable parental consent and assent records were stored separately from the de-identified analysis dataset and were not linked to it. Access to all records was restricted to the student researcher and the adult sponsor. De-identified data will be retained for two years following publication, then permanently deleted.

The GAD-7 was administered as an anonymous screening measure for research purposes only, not intended as a diagnostic instrument. Scores were not disclosed to participants, who could skip any item or withdraw at any time without penalty. A protocol established before data collection specified that

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anyone scoring in the moderate-to-severe range would automatically see school counseling and mental-health resources displayed within the survey itself, since responses could not be tracked back to individual participants. No participant in the sample scored in this range.

Results

Participant Flow

A total of 54 participants were enrolled. Of these, 2 consented and assented but did not go on to complete the study, 3 began but did not complete data collection, and data from 2 participants could not be retrieved. This left a total of 47 participants who completed the study and were included in the analysis (dance group, n = 22; non-dancer control group, n = 25; Figure 2).

Participant Characteristics and Group Comparisons

This study included 47 participants. The Dance Group (n = 22) consisted of adolescents with an average age of 16.26 years (SD = 0.87). All participants in the dance group were in 11th grade (M = 11.16, SD = 2.03). The Control Group (n = 25) had a mean age of 16.28 years (SD = 0.83) and a mean grade level of 10.91 (SD = 0.51), comprising 10th- and 11th-grade students.

Regarding handedness, both groups were predominantly right-handed: the dance group included 17 right-handed individuals, 4 left-handed individuals, and 1 ambidextrous individual (77.3% right-handed), while the control group included 21 right-handed individuals and 4 left-handed individuals (84% right-handed). The groups did not differ significantly in age (p = .94) or grade level (p = .58) (Table 1).

Table 1 Participant demographic characteristics across the Dance Group and Control Group. Data are presented as Mean±Standard Deviation for Age and Grade Level. Handedness is reported as counts of right-handed / left-handed / ambidextrous (R/L/A) participants. P values were calculated using independent-samples t-tests for Age and Grade, and Fisher's Exact Test for Handedness. No significant differences were found between groups on any of the characteristics ($p > .05$), suggesting the two groups were comparable in age, grade level, and handedness.

Variable	Dancers (n=22)	Non-Dancers (n=25)	p-value
Age (Years)	16.26 ± 0.87	16.28 ± 0.83	.94
Grade Level	11.16 ± 2.03	10.91 ± 0.51	.58
Handedness (R/L/A)	17 / 4 / 1	21 / 4 / 0	--

In the Deary–Liewald Simple Reaction Time task (Table 2), dancers demonstrated faster processing speed (M = 337.56 ms, SD = 73.10) compared with non-dancers (M = 440.57 ms, SD = 141.54), and this difference was statistically significant (p = .024, Cohens d = 0.90, 95% CI for the mean difference [37, 169] ms). Dancers may respond to stimuli more efficiently, which would fit with the quick, reactive movement that dance practice requires.

Visuospatial working memory capacity was assessed using the Corsi Block Tapping Task. Dancers achieved a higher mean span (M = 5.56, SD = 0.96) compared with non-dancers (M = 4.14, SD = 2.18), and this difference was statistically significant (p = .037, Cohens d = 0.82, 95% CI for the mean difference [0.44, 2.40] blocks). Dancers scores were also less spread out (smaller SD), so their performance was more consistent as a group.

Among the cognitive measures, the largest group difference was observed in the Mental Rotation Task. Dancers demonstrated higher accuracy in identifying rotated shapes (M = 86.11%, SD = 10.92) compared with non-dancers (M = 75.71%, SD = 10.89), and this difference was statistically significant (p = .013, Cohens d = 0.95, 95% CI for the mean difference [3.98, 16.82] percentage points). Dancers may use more effective strategies for rotating shapes in their heads, although this study cannot show that training is the reason.

The Dance Group reported lower levels of generalized anxiety (M = 4.36, SD = 4.03) compared with the Control Group (M = 7.86, SD = 3.08), and this difference was statistically significant (p = .016, Cohens d = 0.98, 95% CI for the mean difference [1.36, 5.64] points). On average, the dance group scored in the minimal range (0–4) and the control group in the mild range (5–9); neither group mean fell in the clinically elevated (moderate or severe) range.

After adjusting for multiple comparisons with the Benjamini-Hochberg false discovery rate procedure, all four group differences remained statistically significant (adjusted p $\approx$ .03–.04). With four comparisons and a small sample, however, these results should still be treated as preliminary. Under the more conservative Bonferroni correction (α = .0125), no comparison reached significance, although mental rotation (p = .013) came close.

Discussion

This study compared adolescent girls with at least five years of dance training to girls with no formal dance experience on three cognitive tasks and a measure of anxiety. All four hypotheses were supported. Dancers had higher Corsi spans (H1), more accurate mental rotation (H2), and faster reaction times (H3), and they reported lower anxiety on the GAD-7 (H4).

The mental rotation result fits the embodied cognition account, which holds that motor experience shapes cognitive skills. In class, dancers constantly have to rotate what they

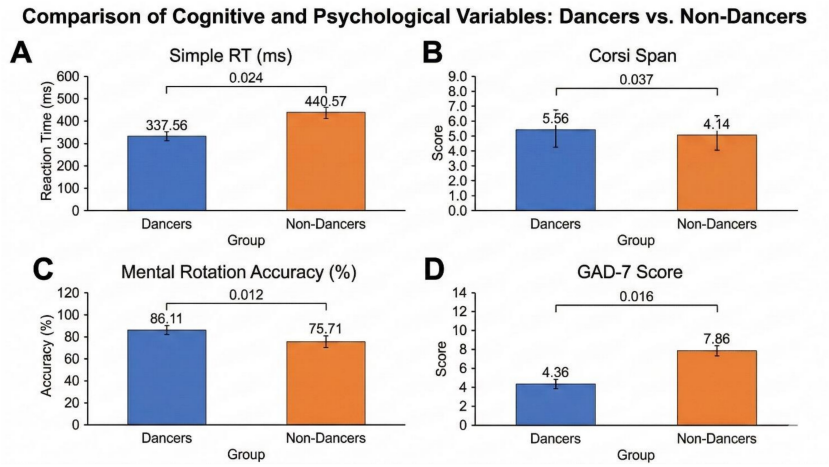

Figure. 2 STROBE-style participant flow diagram showing enrollment, exclusions, and the final analytic sample (N = 47; dance group n = 22, non-dancer control group n = 25).

Table 2 Comparison of neurocognitive and psychological performance between experienced dancers and non-dancer controls. Data are presented as Mean ± Standard Deviation. "Mean Diff." is the dancer minus non-dancer difference in group means (percentage points for Mental Rotation Accuracy). P-values are unadjusted values from independent-samples t-tests (Welch's t-test where the assumption of equal variances was violated); all four comparisons remained significant after Benjamini–Hochberg false discovery rate adjustment (adjusted p ≈ .03–.04; adjusted p < .05 considered significant).

Variable	Dancers (n=22)	Non-Dancers (n=25)	Mean Diff.	p value
Deary–Liewald Simple RT (ms)	337.56 ± 73.10	440.57 ± 141.54	−103.01	.024
Corsi Span	5.56 ± 0.96	4.14 ± 2.18	1.42	.037
Mental Rotation Accuracy (%)	86.11 ± 10.92	75.71 ± 10.89	10.40	.013
GAD-7 Score	4.36 ± 4.03	7.86 ± 3.08	−3.50	.016

see in their heads, for example when mirroring a teacher who is facing them or working out where to stand relative to other dancers on stage[26]. These findings are consistent with work by Rehfeld et al.[9], who found that dance training in older adults was associated with increased volume of the hippocampus, a region involved in spatial memory and orientation. Because only one spatial reasoning task was used, however, these data cannot show whether this advantage generalizes to other spatial skills.

The Corsi result makes sense given how much of dance involves memorizing long sequences of steps and positions and then reproducing them exactly. The faster reaction times may likewise reflect years of practice turning music and visual cues into precisely timed movement. Each skill tested here is one that dance uses regularly, which fits an embodied cognition account. The study did not include a task unrelated to dance, though, so it cannot show that the differences are limited to dance-trained skills. It is also possible that girls who already have strong spatial or attention skills are more likely to start dance and stay with it, and these data cannot rule that out.

Implications

The results may also matter for education. Subjects such as geometry, architectural design, and organic chemistry require students to picture and rotate 3D structures in their heads, and STEM (Science, Technology, Engineering, and Mathematics) courses depend on this skill. Spatial ability is a well-established predictor of achievement in STEM fields[35]. If the link between dance and spatial ability holds up, dance could indirectly support skills used in science and engineering, but this study did not test that.

Anxiety and Emotional Regulation

Dancers scored significantly lower on the GAD-7 than non-dancers. One possible reason is what a dance studio offers: a regular routine, physical activity, and a group of peers and teachers[14]. Neither group was free of anxiety symptoms, though. The dance group averaged in the minimal range and the non-dancers in the mild range, which is in line with national data showing that mental health concerns are common

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among U.S. adolescents[2,3]. It is tempting to think of dance as a kind of "moving meditation," and the results point in that direction, but the idea is speculative, and the sample is too small for firm conclusions.

Limitations

This study has several limitations. First, because the design is cross-sectional, it shows associations, not causes. Second, the dancers trained in different styles. Participants trained in forms such as ballet, hip hop, contemporary, and folk, which differ in physical intensity and in the specific perceptual, motor, and memory demands they place on performers. Because participants were not stratified by style, and training intensity beyond the minimum eligibility threshold (e.g., actual hours per week or competitive level) was not recorded, this study could not examine whether particular styles or intensities were more strongly associated with the outcomes observed; future work should collect and analyze this information. Third, because testing was conducted online, variation in participants hardware could have introduced minor timing "noise" into the reaction-time measurements[30]. Device, browser, and display characteristics were not logged, and per-trial timing could not be independently validated, so the reaction-time findings should be considered exploratory. Fourth, all participants were girls from one area, so the results may not apply to boys or to other populations. Testing was also unsupervised, so there was no way to confirm that participants followed the pre-test instructions.

The biggest limitation is confounding. Participants were not randomly assigned, so dancers and non-dancers may differ in other ways that also affect cognition and anxiety, including habitual sleep, physical activity outside of dance, diet, socioeconomic status, parental education, participation in other structured or competitive activities, music training, screen and video-game use, academic achievement, subclinical anxiety or neurodevelopmental history (beyond the exclusion of diagnosed disorders), and menstrual-cycle phase. None of these variables were measured in the present study, so groups could not be matched on them or statistically adjusted (for example, through regression with prespecified covariates). Excluding students with diagnosed psychiatric disorders also restricted the range of anxiety scores, which limits the generalizability of the GAD-7 findings. The pre-test instructions (no caffeine or stimulants, normal sleep, a quiet room) help with differences on the day of testing, but not with longer-lasting differences between the groups. The results therefore cannot be credited to dance training alone. Future studies should measure these factors and either match groups on them or include them as covariates.

A longitudinal study that follows non-dancers for six months to a year after they start dance would help show which way the relationship runs, and a randomized trial would be needed to show that dance causes the differences. Diffusion MRI could also be used to see whether white-matter integrity in adolescents changes with intensive dance training.

Conclusion

Adolescent girls with at least five years of dance training did better than non-dancers on tests of visuospatial reasoning, working memory, and reaction time, and they reported less anxiety. The dancers' average GAD-7 score was in the minimal range, while the non-dancers' was in the mild range. These results do not show that dance causes the differences, but they give good reason to test dance in longitudinal and randomized studies as a possible support for adolescent development, and not just as an elective.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author contribution

Shivani Munaga (SM) was responsible for the conceptualization of the study, software development and coding of the cognitive assessment tools, data collection, formal analysis, and the original drafting of the manuscript. Joanne Vakil (JV) provided methodology supervision, ensured adherence to ethical research standards, and mentored the overall research process. Savitha Subramaniam (SS) provided a critical review of the manuscript. All authors contributed to the article and approved the submitted version.

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Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation, to any qualified researcher. To protect the privacy of the adolescent participants, data will be provided in a de-identified format upon request for two years following publication, after which the data will be permanently deleted, as described in the Ethical Considerations.

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